Dose-Enhancing Agent for Radiotherapy at 6 and 10 MV Medical Linac

A.A.Baulin[a,b,1], ***E.S.Sukhikh***[c,a], ***L.G.Sukhikh***[b,c]

[a] *National Research Tomsk Polytechnic University, Tomsk, Russia*
[b] *Gamma Clinic High-Precision Radiology Centre (Gamma Medtechnology Ltd), Obninsk*
[c] *Tomsk Regional Oncology Centre, Tomsk, Russia*

Radiation therapy is an important and effective technique of malignant tumors treatment [1]. Actual problem of radiotherapy is increasing effectiveness and reducing side effects of the treatment. Binary technologies of radiation therapy can be used to improve treatment results. One of the most promising technology is contrast-enhanced or "photon-capture" radiotherapy (PCT) [2]. The PCT is effective at low X-ray energies where the photoelectric effect dominates (up to about 200 keV). Accordingly, the energy escalation of photon beams leads to a gradual decrease the effect of the PCT. However, low-energy photons for medium- and deep-seated tumors are limited due to their low penetrating power. For irradiation of deep-seated tumours, the megavoltage photon beams from linear accelerators are widely used, where the Compton effect is maximal and the photoelectric effect is minimal.

Although the effect of PCT should be low, different studies shows the escalation of energy in the target volume due to the introduction of dose-enhancing agent (DEA) at megavolt photon beams [4-6]. Some authors suggest that the observed effect is caused by the wide energy spectrum of photon beams, which including the low-energy kilovolt energy range.

References

[1] R.Baskar, K.A.Lee, R.Yeo, et al. Cancer and Radiation Therapy: Current Advances and Future Directions //International Journal of Medical Sciences. V.**9**(3), P.193-199.

[2] I.N.Sheino, P.V.Izhevskij, A.A.Lipengolts, et al. Development of binary technologies of radiotherapy of malignant neoplasms: condition and problems //Bulletin of Siberian Medicine. 2017. V.**16**(3). P.192-209.

[3] S.Jain, JA.Coulter, AR.Hounsell et al. Cell-specific radiosensitization by gold nanoparticles at megavoltage radiation energies //Int J Radiat Oncol Biol Phys. 2010. V.**79**. P.531-9.

[4] D.Chithrani, S.Jelveh, F.Jalali, et al. Gold nanoparticles as radiation sensitizers in cancer therapy //Radiat Res. 2010. V.**73**. P.719-28.

[5] R.Berbeco. H.Korideck. W.Ngwa et al. TUвЃ˝ΘCвЃ˝ΘBRBвЃ˝Θ11: In Vitro Dose Enhancement from Gold Nanoparticles under Different Clinical MV Photon Beam Configurations //AAPM. 2012. V.**39**(6). P. 3900-3901.

[1] Corresponding author: baulin.91@mail.ru